

Nocturnal Bending Brace

Background

- Benchmark for nighttime, scoliosis management for more 30 + years.
- Manufactured by Hanger Inc. for 30+ years.
- 25+ research papers published on this design.

Goals

1. Maintain the patient's scoliotic curvature at, or near, pre-brace values throughout the growth period and on to skeletal maturity.
2. Promote better brace wear compliance through the nocturnal wear.
3. Promote positive self-image & reduce burden of treatment.

Principles

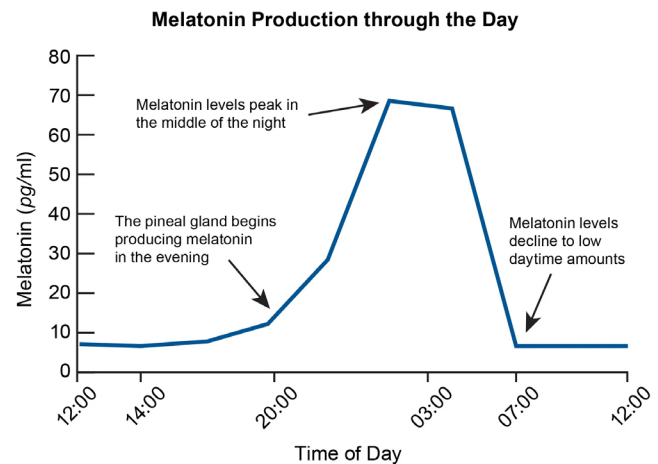
- **Growth Modulation (unbending)**
 - The rate of the epiphyseal growth plate is affected by pressure applied to its axes.
 - An area of increased pressure inhibits growth and an area of decreased pressure accelerates growth.
- **In Brace Correction (overcorrection)**
 - The amount of in brace correction is a predictor of long-term outcome of treatment.
 - CCB principles overcorrect a spinal curve in accordance with the spine flexibility
 - Maintain the patient's scoliotic curvatures at, or near, pre-brace values throughout the growth period and on to skeletal maturity.
- **Patient Compliance (comfort)**
 - Patient comfort and compliance is promoted through nocturnal wear.
 - Compliance is measured by a compliance monitor embedded into the device.

Theory: Growth Modulation

Gravity vs. Growth

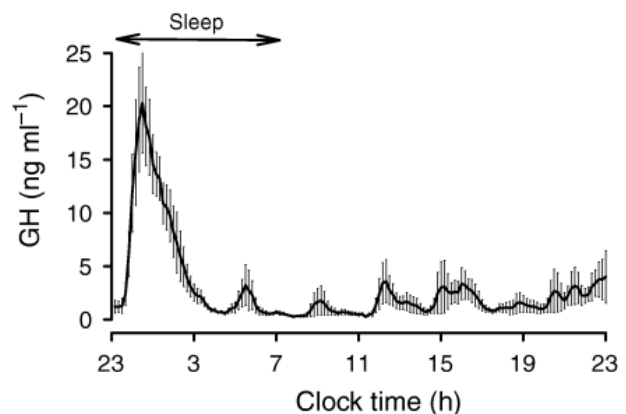
- IF scoliosis is a disorder of GRAVITY then daytime support is necessary.
- IF scoliosis is a disorder of GROWTH then nighttime bracing may be all that's required.

Melatonin



- Levels are high at **night** – minimal levels during the day
- Levels are low in patients with progressive AIS

Growth Hormone is only present & active at night



BraBrandenberger G, "The 24-h growth hormone rhythm", *J Sleep Res.* 2004 Sep;13(3):251-5

Tibial Growth in Lambs

“...at least 90% of **bone elongation occurs during recumbency** and almost no growth occurs during standing or locomotion. The authors hypothesize that growth may also occur in children during rest or sleep.”

Noonan KJ, et al. *JPO* 2004; 24(6):726-31

Evidence

Spinal Growth Modulation by Compression

1. Villemure I, Aubin CE, Dansereau J, Labelle H. *European Spine Journal*. 13:83, 2004
2. Newton PO, et.al. *Spine*. 30:2608, 2005
3. Stokes IA, Aronsson DD, et.al. *Journal of Orthopaedic Research*. 24:1327, 2006

NBB Options

NBB-Standard	NBB-II	NBB-Lite
<ul style="list-style-type: none"> • Nighttime scoliosis management • Benchmark for 35+ years • Long single curves 	<ul style="list-style-type: none"> • Nighttime dynamic treatment for Thoracolumbar Type II curves • Dynamic alignment strap 	<ul style="list-style-type: none"> • Nighttime wear for early intervention • Cobb angles > 25° • Neuromuscular patients • Weaning/transition • Multi-durometer foam

Calculate wearing compliance % with iO™ Compliance Monitor..

In Brace Correction Correlates to Biomechanical Effectiveness of Brace Treatment in AIS

“In the framework of the **Hueter-Volkman principle**...in brace correction predicts long-term outcome of the treatment and provides insights in the understanding of brace biomechanics.”

Clin J, Aubin CÉ, Sangole A, Labelle H, Parent S *Spine* 2010 ;35(18):1706-13.

Growth Modulation

- Bending increases pressure on convex vertebral growth centers to reduce growth.
- Can be used for high thoracic curves.
- Double curves are difficult to brace but can be treated by bending brace.